CLAIMS

WHAT IS CLAIMED IS:

1. A method for forming a fuel cell component comprising:

depositing a hydroxide or a oxyhydroxide form of said component; and

hydrothermally dehydrating said hydroxide or oxyhydroxide form of said component;

wherein said hydrothermally dehydrating said component establishes a grain structure of said component.

2. The method of claim 1 further comprising firing said fuel cell component to an operating temperature of a fuel cell to fix a disposition of said fuel cell component.

3. The method of claim 2, wherein said fuel cell comprises a solid oxide fuel cell (SOFC).

4. The method of claim 3, wherein said fuel cell component comprises an anode.

5. The method of claim 3, wherein said fuel cell component comprises an electrolyte.

6. The method of claim 3, wherein said fuel cell component comprises a cathode.

7. The method of claim 3, wherein said fuel cell component comprises an anode, an electrolyte, and a cathode coupled together.

8. The method of claim 7, wherein said hydrothermally dehydrating said fuel cell component is performed simultaneously on said anode, said electrolyte, and said cathode.

9. The method of claim 7, wherein said hydrothermally dehydrating said fuel cell component is performed individually on each of said anode, said electrolyte, and said cathode.

10. The method of claim 3, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on a low temperature support structure.

11. The method of claim 10, wherein said low temperature support structure comprises a fuel manifold.

12. The method of claim 10, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on said low temperature support structure according to a screen printing process.

13. The method of claim 10, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on said low temperature support structure according to a tape casting process.

14. The method of claim 10, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on said low temperature support structure according to a doctor blade process.

15. The method of claim 10, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on said low temperature support structure according to a spin-on process.

16. The method of claim 10, wherein said hydroxide or oxyhydroxide form of said fuel cell component is deposited on said low temperature support structure according to a colloidal spray deposition process.

17. The method of claim 1, wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said fuel cell component comprises:

heating said hydroxide or oxyhydroxide form of said fuel cell component; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said fuel cell component both dissolves and recrystallizes said hydroxide or oxyhydroxide form of said fuel cell component.

18. The method of claim 17, further comprising introducing a potential of Hydrogen (pH) control into said hydrothermal dehydration process.

19. A method of forming a solid oxide fuel cell (SOFC) comprising:

depositing a hydroxide or a oxyhydroxide form of an anode material;

depositing a hydroxide or a oxyhydroxide form of an electrolyte material;

depositing a hydroxide or a oxyhydroxide form of a cathode material; and

hydrothermally dehydrating said hydroxide or oxyhydroxide form of said deposited materials;

wherein said hydrothermally dehydrating said materials sinters said materials.

20. The method of forming a SOFC of claim 19, further comprising firing said materials to an operating temperature of said SOFC to fix a disposition of said materials.

21. The method of forming a SOFC of claim 20, wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said deposited materials is performed immediately after said deposition of each of said materials.

22. The method of forming a SOFC of claim 19, wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said materials comprises:

heating said hydroxide or oxyhydroxide form of said material; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said material both dissolves and recrystallizes said hydroxide or oxyhydroxide form of said material.

23. The method of forming a SOFC of claim 22, further comprising introducing a potential of Hydrogen (pH) control into said hydrothermal dehydration process.

24. The method of forming a SOFC of claim 19, wherein said hydroxide or oxyhydroxide form of said anode or said cathode is deposited on a low temperature support structure.

25. The method of claim 24, wherein said low temperature support structure comprises a fuel manifold.

26. A fuel cell comprising:

a cathode;

an anode; and

an electrolyte disposed between said anode and said cathode;

wherein one of said anode, said cathode, or said electrolyte is formed by depositing a hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte, and hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

27. The fuel cell of claim 26, wherein said fuel cell comprises a solid oxide fuel cell (SOFC).

28. The fuel cell of claim 26, wherein said hydrothermal dehydration comprises:

heating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte both dissolves and recrystallizes said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

29. The fuel cell of claim 28, wherein said hydrothermal dehydration further comprises introducing a potential of Hydrogen (pH) control into said hydrothermal dehydration process.

30. The fuel cell of claim 26, wherein said anode, said cathode, and said electrolyte are all formed by a hydrothermal dehydration process.

31. The fuel cell of claim 30, wherein said anode, said cathode, and said electrolyte each go through an individual hydrothermal dehydration process, said hydrothermal dehydration process being configured to produce a desired grain structure in said anode, said cathode, and said electrolyte.

32. The fuel cell of claim 30, further comprising a support structure, wherein said anode, said cathode, and said electrolyte are all formed on said support structure.

33. The fuel cell of claim 32, wherein said support structure further comprises a fuel manifold.

34. The fuel cell of claim 32, wherein said fuel manifold comprises a ferritic stainless steel.

35. An electrochemical apparatus comprising:

a housing; and

a fuel cell including an anode, a cathode, and an electrolyte disposed within said housing;

wherein one of said anode, said cathode, or said electrolyte is formed by depositing a hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte on said housing, and hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

36. The electrochemical apparatus of claim 35, wherein said anode, said cathode, and said electrolyte are all formed by a hydrothermal dehydration process.

37. The electrochemical apparatus of claim 36, wherein said hydrothermal dehydration process comprises:

heating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte both dissolves and recrystallizes said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

38. The electrochemical device of claim 37, wherein said hydrothermal dehydration further comprises introducing a potential of Hydrogen (pH) control into said hydrothermal dehydration process.

39. The electrochemical device of claim 36, wherein said anode, said cathode, and said electrolyte each go through an individual hydrothermal dehydration process, said hydrothermal dehydration process being configured to produce a desired grain structure in said anode, said cathode, or said electrolyte.

40. An electronic device comprising:

an electrochemical cell providing power to an electrical power consuming apparatus;

a fuel source; and

a fuel flow path fluidly coupling said electrochemical cell and said fuel source;

wherein said electrochemical cell includes a housing, a fuel cell including an anode, a cathode, and an electrolyte disposed within said housing;

wherein one of said anode, said cathode, or said electrolyte is formed by depositing a hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte on said housing, and hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

41. The electronic device of claim 40, wherein said anode, said cathode, and said electrolyte of said electrochemical apparatus are all formed by a hydrothermal dehydration process.

42. The electronic device of claim 41, wherein said hydrothermal dehydration process comprises:

heating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte both dissolves and recrystallizes said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

43. The electronic device of claim 40, wherein said hydrothermal dehydration further comprises introducing a potential of Hydrogen (pH) control into said hydrothermal dehydration process.

44. The electronic device of claim 40, wherein said anode, said cathode, and said electrolyte each go through an individual hydrothermal dehydration process, said hydrothermal dehydration process being configured to produce a desired grain structure in said anode, said cathode, and said electrolyte.

45. A means for reducing the processing temperature necessary during the manufacture of a fuel cell comprising:

a fuel cell including a cathode, an anode, and an electrolyte disposed between said anode and said cathode;

wherein one of said anode, said cathode, or said electrolyte is formed by depositing a hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte on a housing, and hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

46. The means for reducing the processing temperature during the manufacture of a fuel cell of claim 45, wherein said fuel cell comprises a solid oxide fuel cell (SOFC).

47. The means for reducing the processing temperature during the manufacture of a fuel cell of claim 45, wherein said hydrothermal dehydration process comprises:

heating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte; and

providing a high background pressure of water;

wherein said hydrothermally dehydrating said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte dissolves and recrystallizes said hydroxide or oxyhydroxide form of said anode, said cathode, or said electrolyte.

48. The means for reducing the processing temperature during the manufacture of a fuel cell of claim 47, wherein said anode, said cathode, and

said electrolyte are all formed by a single hydrothermal dehydration process.

49. The means for reducing the processing temperature during the manufacture of a fuel cell of claim 47, wherein said anode, said cathode, and said electrolyte are each formed by independent hydrothermal dehydration processes.

50. The means for reducing the processing temperature during the manufacture of a fuel cell of claim 49, wherein each independent hydrothermal dehydration process is configured to provide a desired grain structure in said anode, said cathode, and said electrolyte.